

LAKE WASHINGTON GENERAL INVESTIGATION

Greater Shilshole Bay Investigations of Juvenile Salmon Passage and Habitat Utilization

Task I.A Recover in Shilshole Bay PIT-tagged juvenile Chinook salmon that have used alternative pathways through the Locks

Conduct high intensity, low frequency sampling to recover the maximum number of PIT-tagged juvenile chinook salmon during peaks in their migration from the Lake Washington Ship Canal through the Locks to Shilshole Bay.

Task I.B Assess the overall use of Shilshole Bay by juvenile salmon, irrespective of their origin, and related (potential predators and competitors) fishes

Conduct low intensity, high frequency “background” sampling of all species of fish in several “indicator” locations/habitats in Shilshole Bay.

Task II.C Document juvenile salmon diet and prey resources in the greater Shilshole Bay estuary.

Address the natural and unique capacity of the greater Shilshole Bay estuary to support foraging by juvenile salmon that are both migrating through the Ship Canal and Locks as well as rearing in the estuary. An effort will be made to also collect diet and prey resource information above the Locks.

APPROACH



- Regular (weekly), systematic (standardized net, protocol) beach seine sampling at 11 sites across estuarine gradient, May-October 2001
- Intensive “blitz” sampling during 18-22 June 2001, anticipating maximum recovery of PIT tags
- Basic data: species, wild/adipose clipped, length, stomach contents (gastric lavage) and PIT tag recovery.
- Regular (biweekly) sampling of (a) epibenthic prey resources at six site using excavated sampling cylinder and (b) pelagic prey at four sites (including one upstream of Locks) using vertical plankton hauls, to document potential prey availability relative to shoreline habitat and position along estuarine gradient

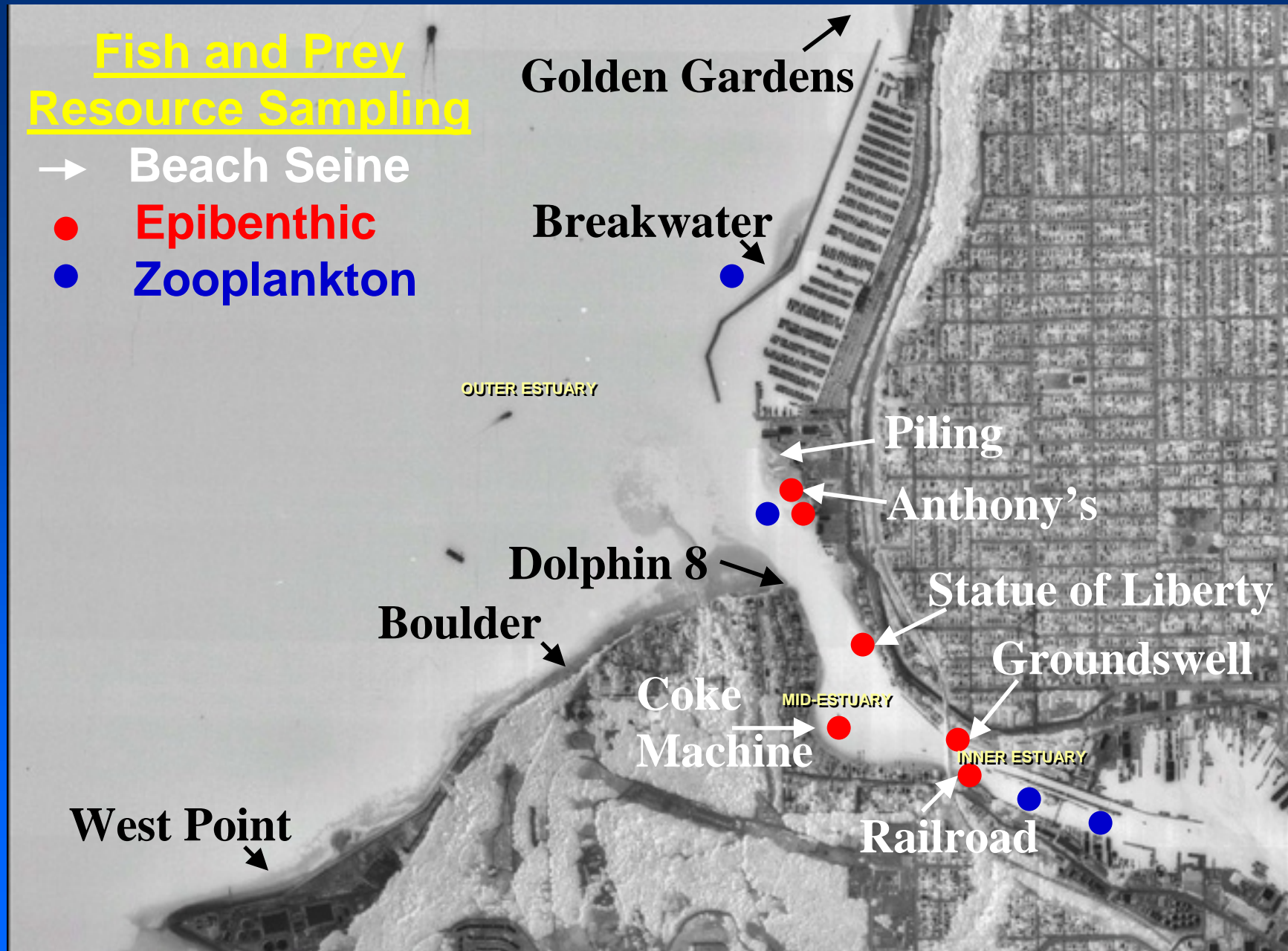
Shilshole 2001 Sampling Sites

Fish and Prey Resource Sampling

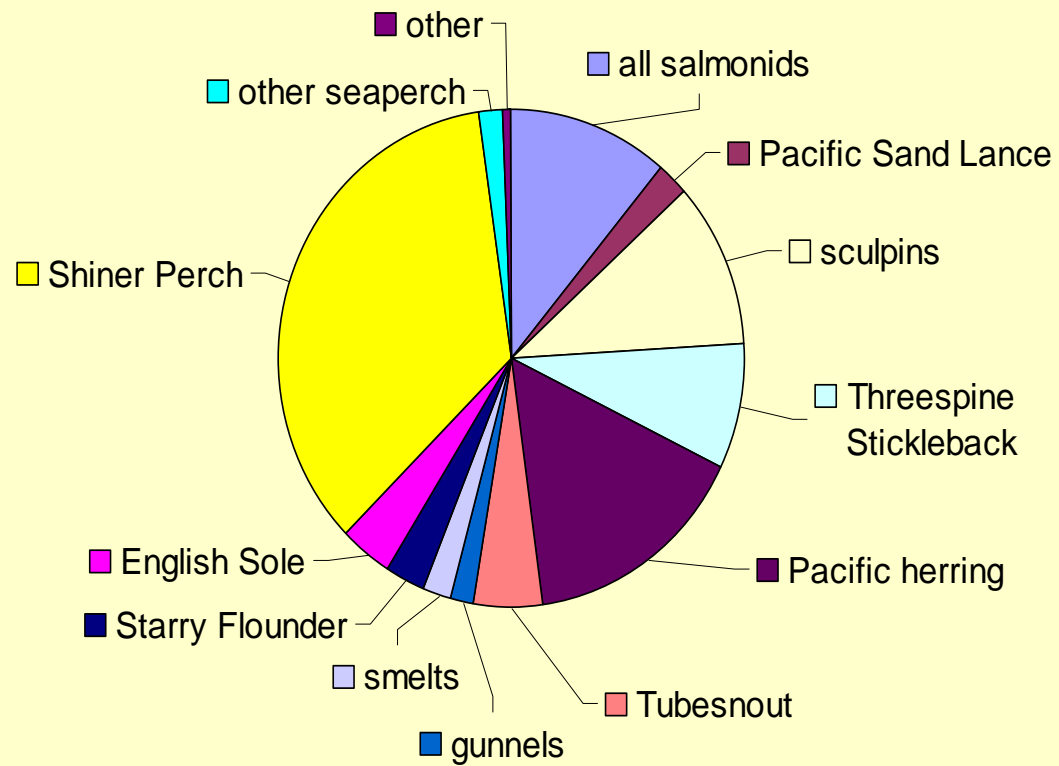
→ Beach Seine

● **Epibenthic**

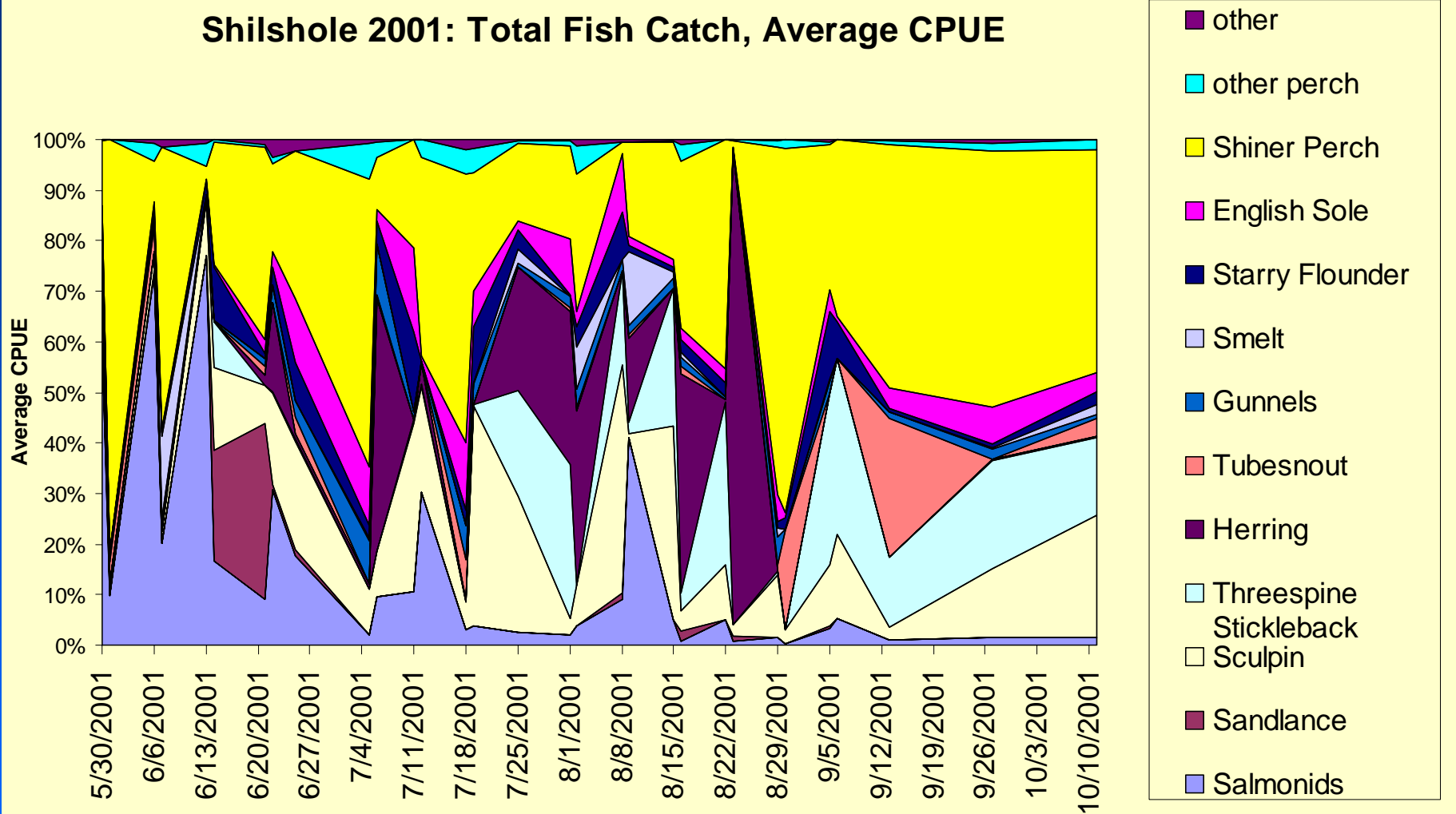
● **Zooplankton**



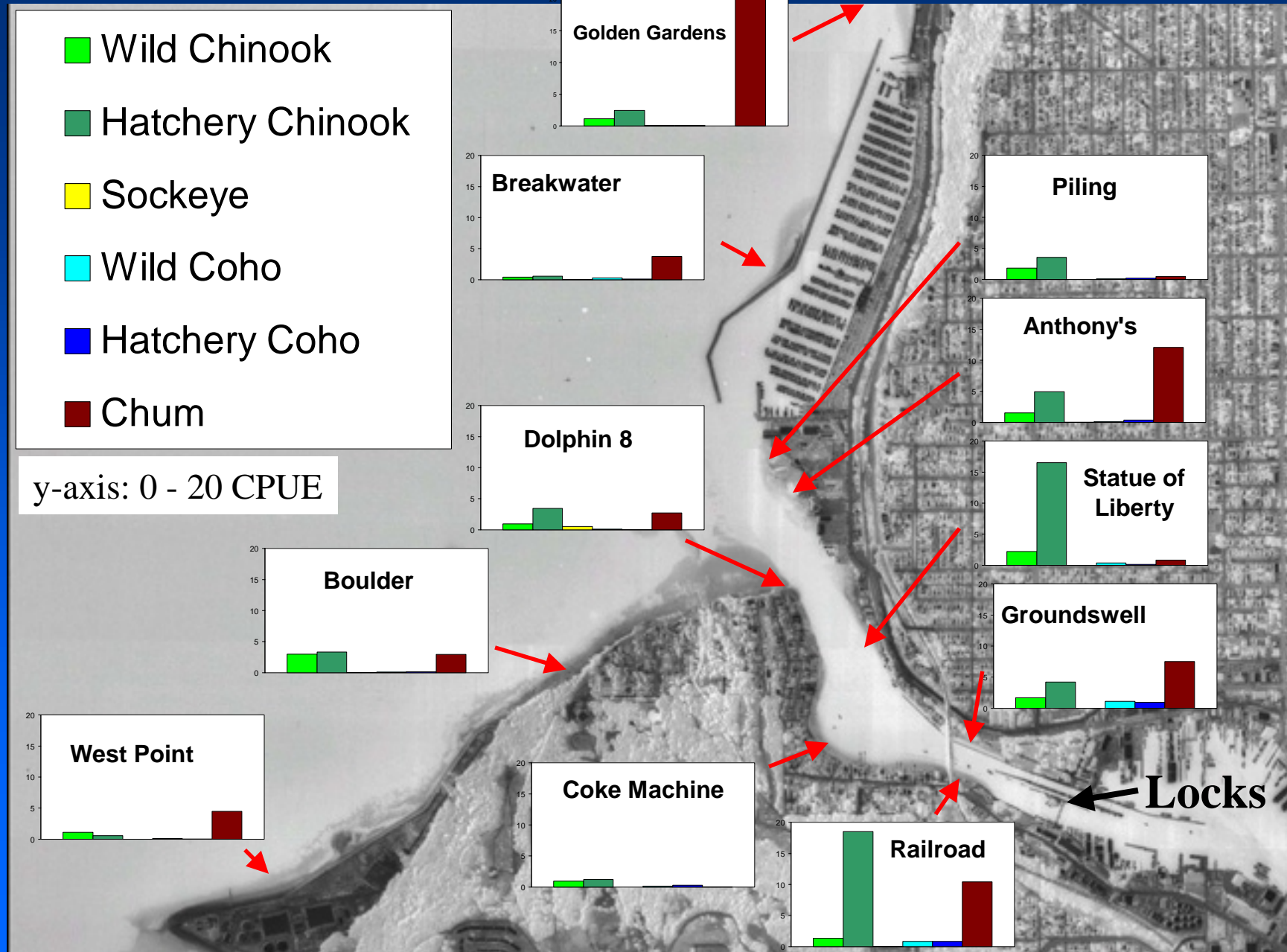
Shilshole 2001: Total Average CPUE



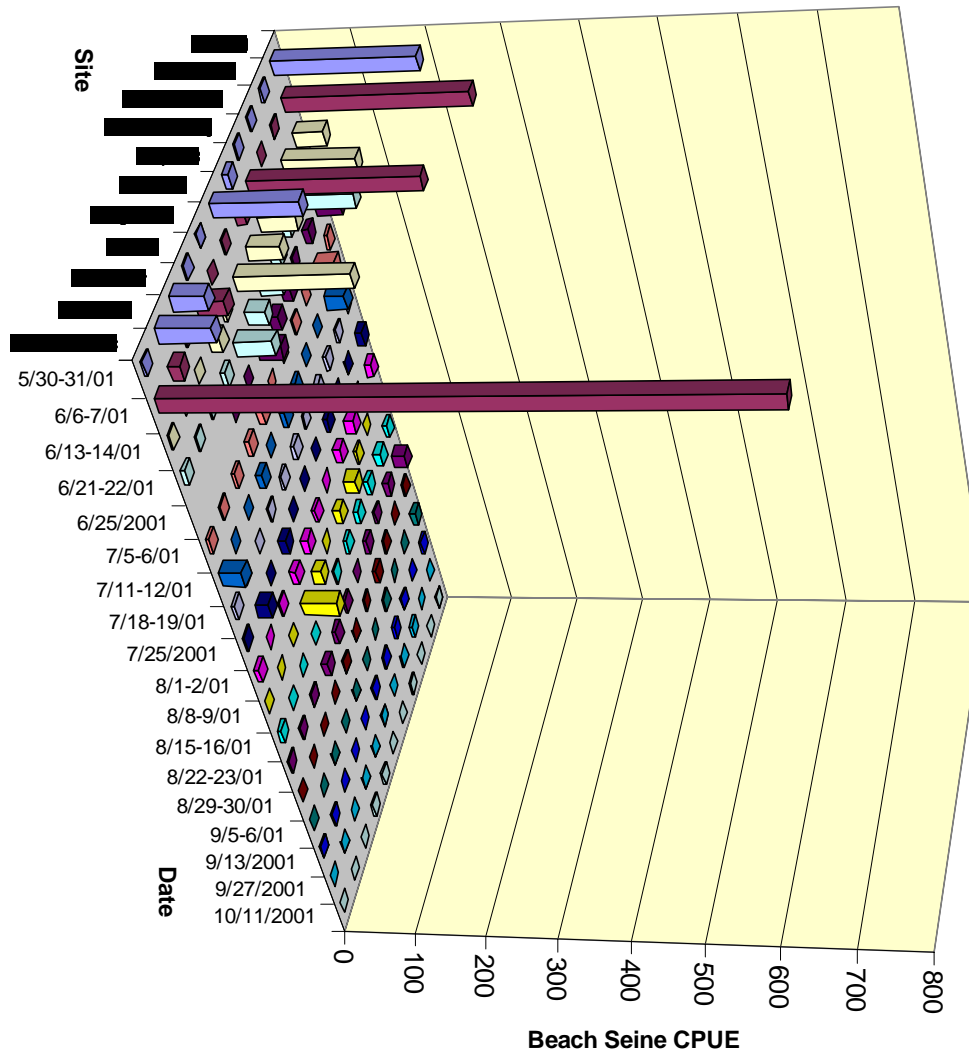
Shilshole 2001: Total Fish Catch, Average CPUE



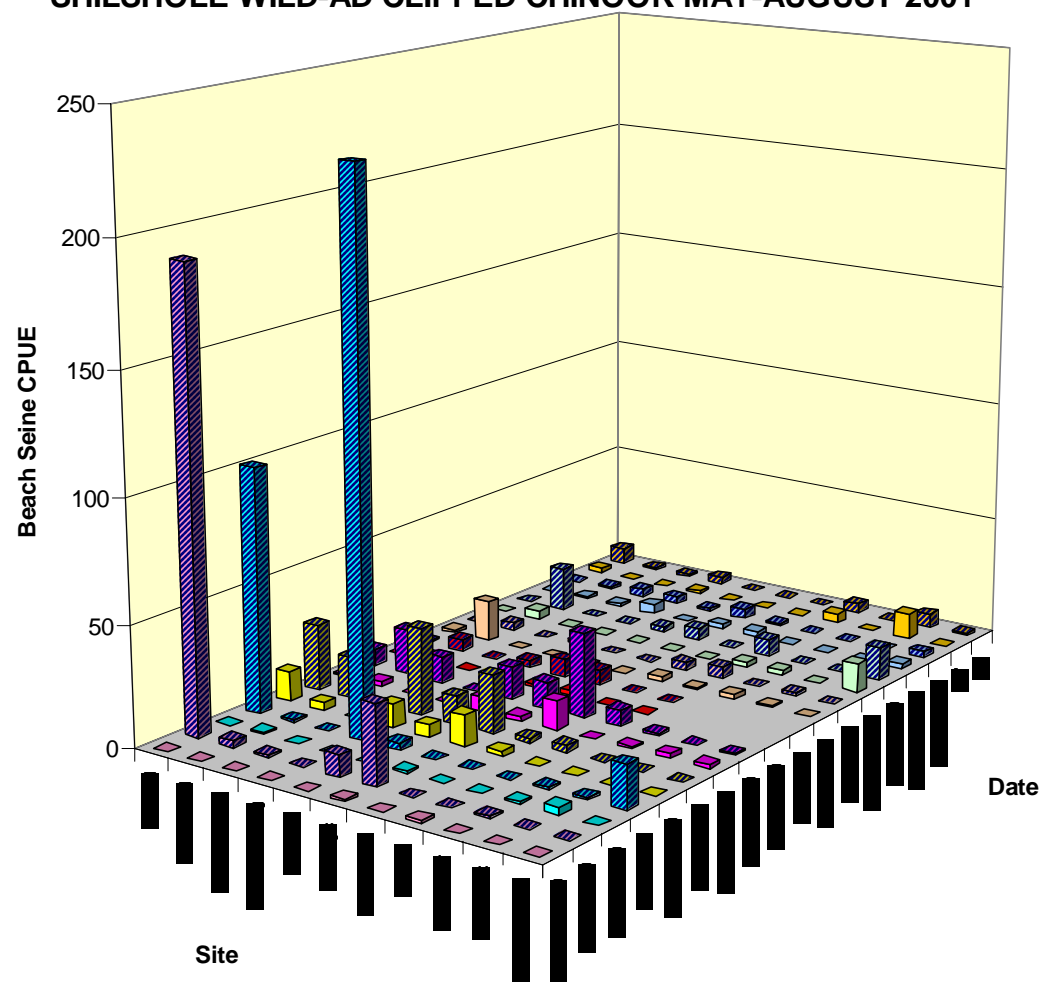
Shilshole 2001: Average Juvenile Salmonid CPUE



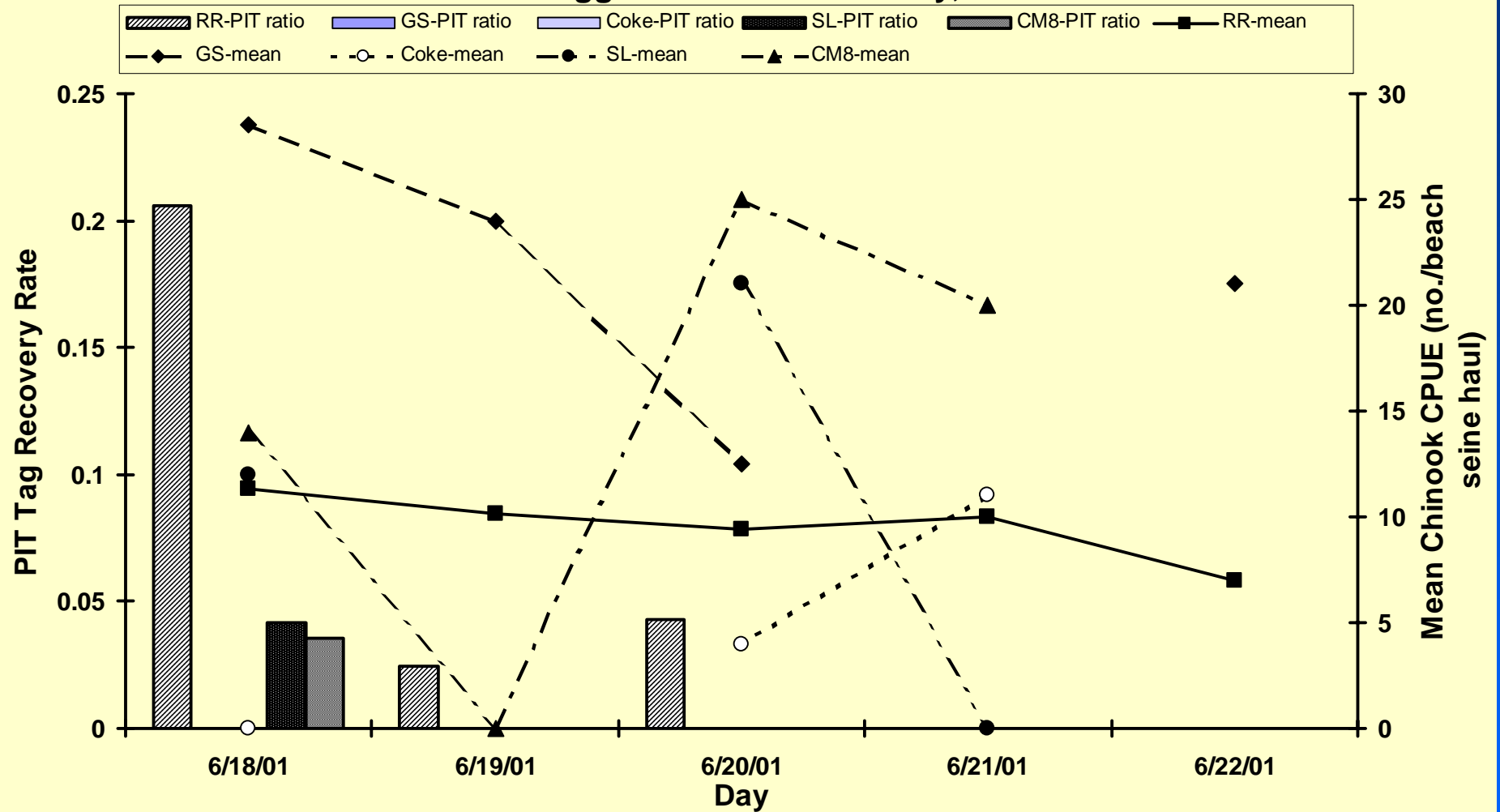
SHILSHOLE SALMONID CATCHES MAY-OCTOBER 2001



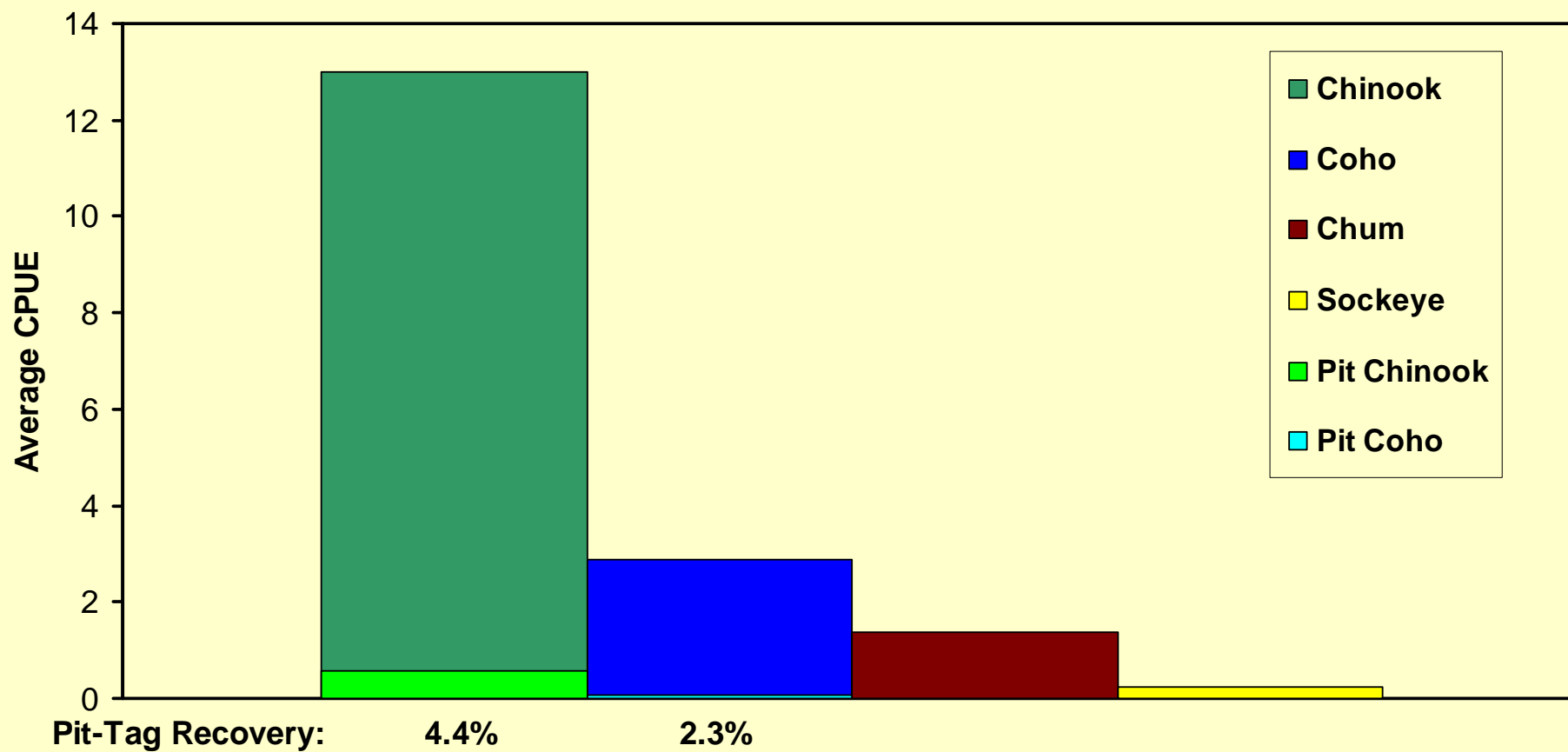
SHILSHOLE WILD-AD CLIPPED CHINOOK MAY-AUGUST 2001



Shilshole PIT-Tagged Chinook Recovery, 6/18-22/01



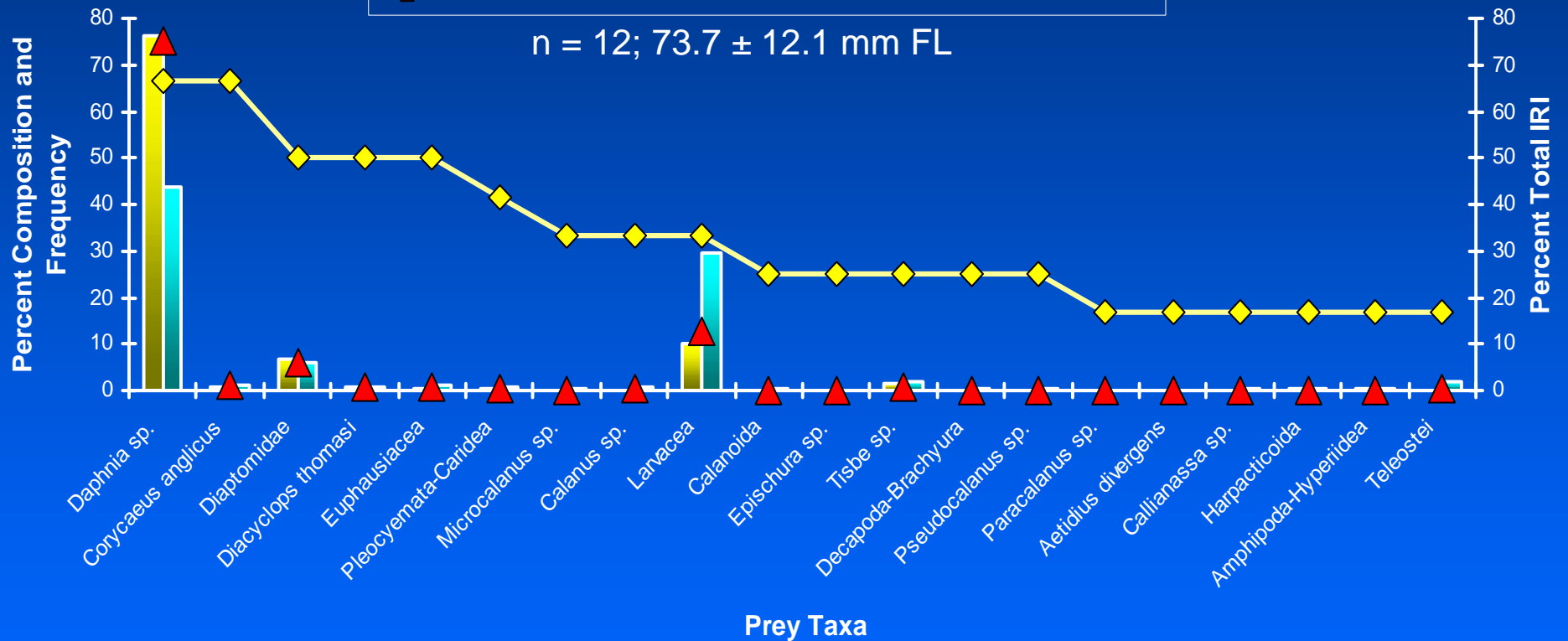
**BLITZ: Average Juvenile Salmonid CPUE from Railroad Site
(n = 30 beach seines)**



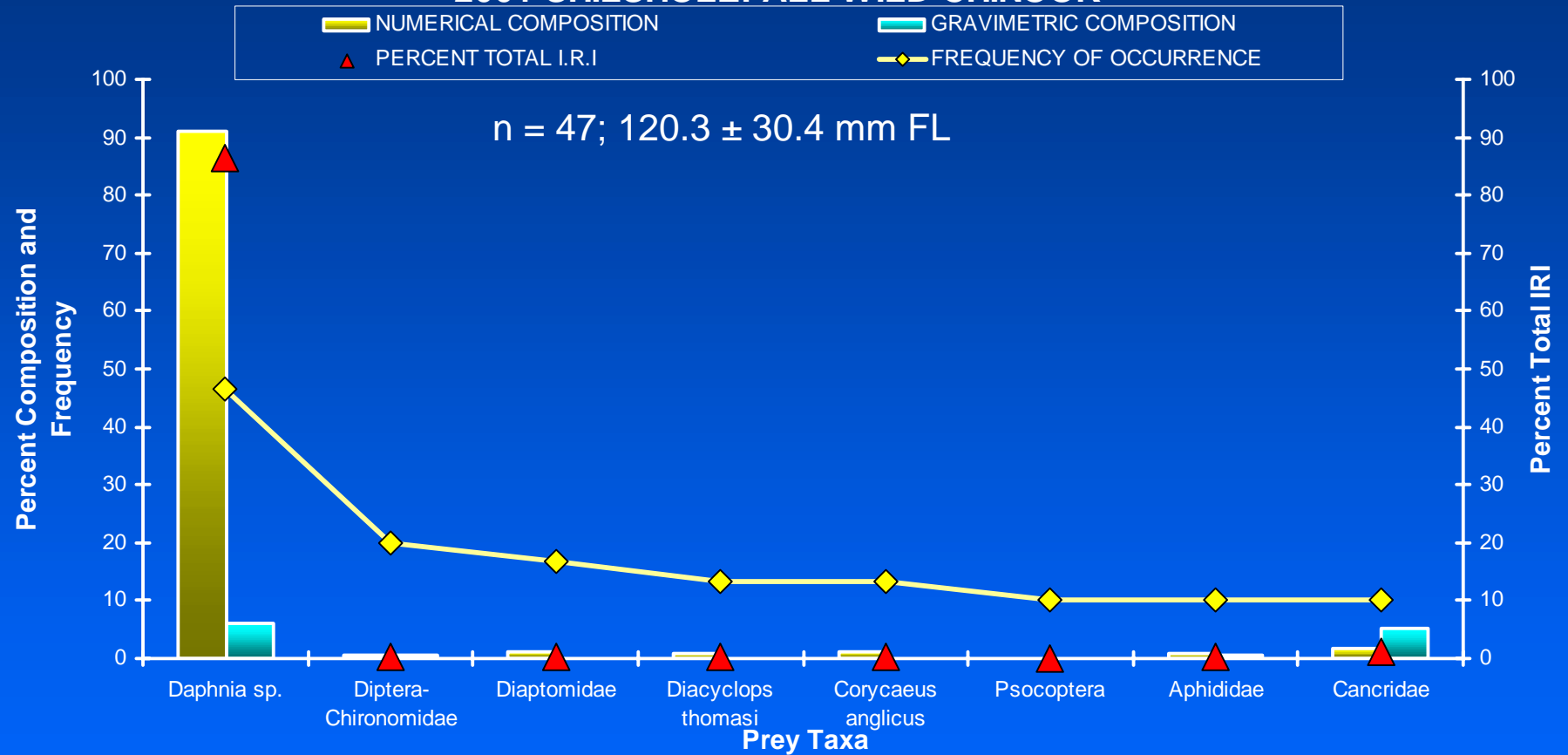
2001 SHILSHOLE: ALL WILD CHUM

■ NUMERICAL COMPOSITION ■ GRAVIMETRIC COMPOSITION
▲ PERCENT TOTAL I.R.I ◆ FREQUENCY OF OCCURRENCE

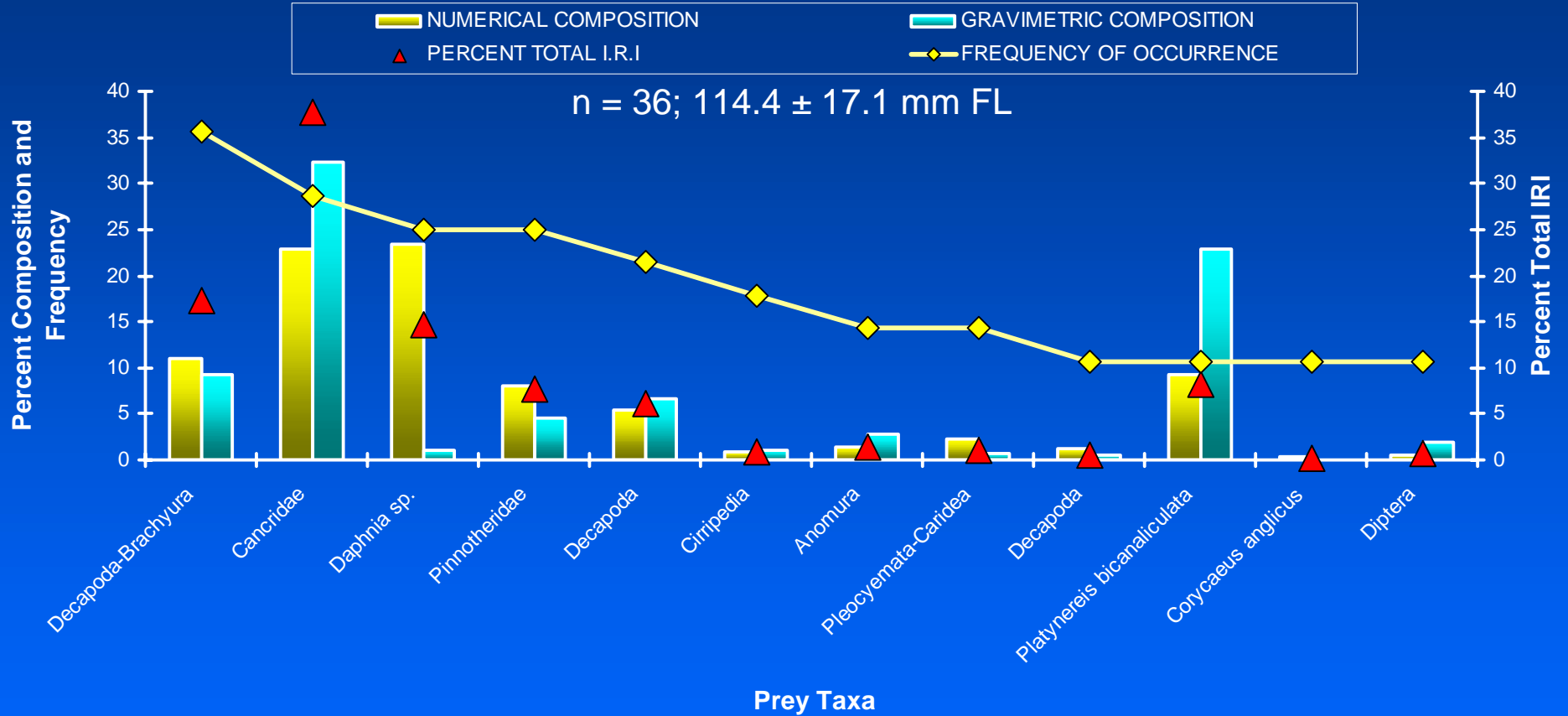
n = 12; 73.7 ± 12.1 mm FL



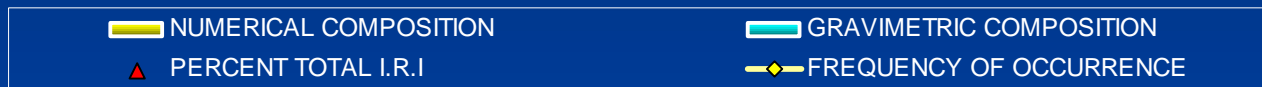
2001 SHILSHOLE: ALL WILD CHINOOK



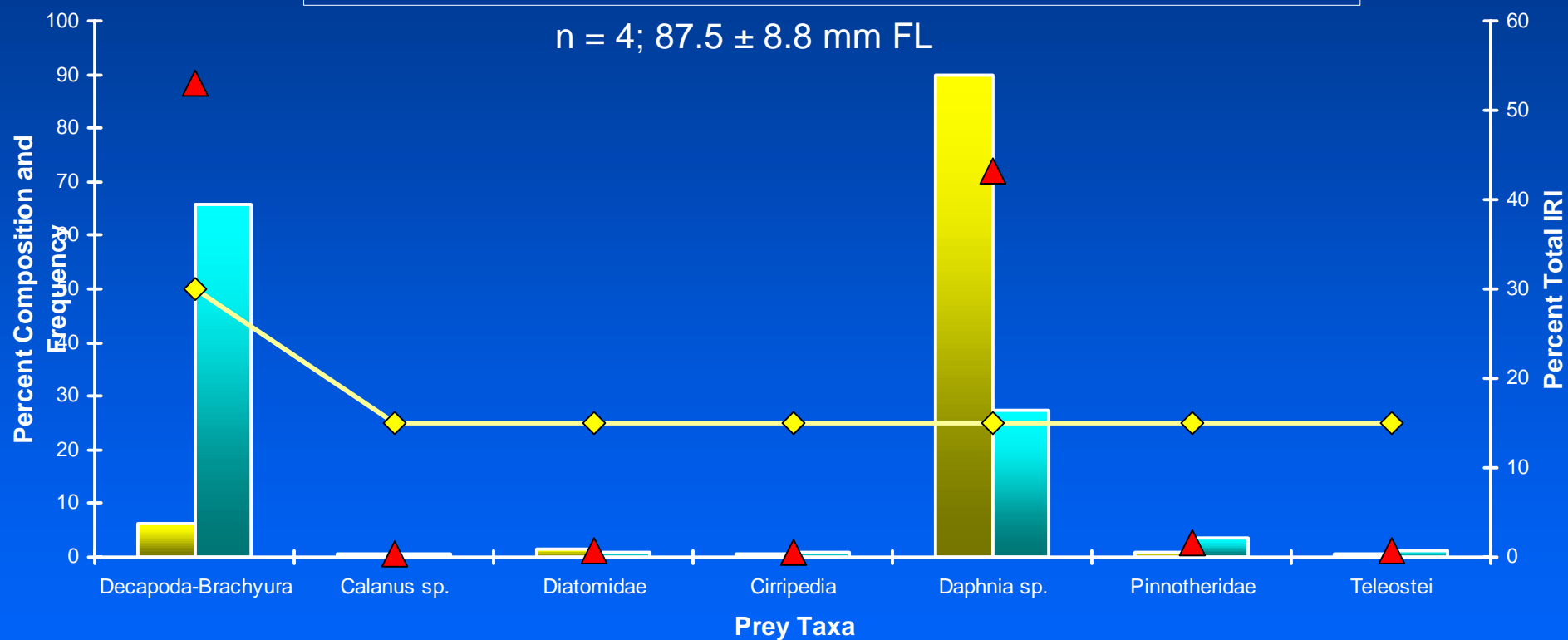
2001-SHILSHOLE: ALL HATCHERY CHINOOK



2001 SHILSHOLE: ALL WILD COHO



n = 4; 87.5 ± 8.8 mm FL



PRELIMINARY CONCLUSIONS

- Overall composition of nearshore fish community in Shilshole Bay dominated by shiner perch, Pacific herring, Pacific staghorn sculpin, threespine stickleback and Pacific salmon; salmon prominent during May-June outmigration
- Chum and chinook abundant salmonids; chum throughout but particularly nearest Locks and at Golden Gardens; chinook near Locks and along northern margin of inner estuary, with hatchery fish predominating nearer Locks and steadily decline to outside estuary; relatively consistent densities of wild chinook at all sites
- Inner estuary (Railroad) and mid- to outer estuary transition (Statue of Liberty, Dolphin 8, Anthony's, Piling Beach) tended to have highest densities over time, through late June ("pinch or prey"?)
- Early flux of hatchery chinook, later increased proportion of wild chinook; higher proportion, often equal, of wild fish in outer estuary later in outmigration (sources???)
- During blitz, early pulse of PIT-tagged fish distributed widely within inner and mid-estuary during first day, declining through day three; but overall CPUE relatively consistent in inner estuary (Railroad); staging?
- Prey influx from Lake and Ship Canal supporting much of juvenile salmon foraging: wild chum fed almost exclusively on (fw) *Daphnia* and to a lesser degree larvaceans (marine, arrowworms), reflecting capture location; wild chinook also consumed predominantly *Daphnia* but hatchery chinook diet much more diverse and including crab larvae of various taxa and polychaete annelids as well as *Daphnia*; wild coho (but low n) diet also included *Daphnia* and crab larvae

CONTINUED ANALYSES

- Further detail in chronology of fish composition and density by site and time across estuarine gradient
- Examine salmon distribution and diet over space and time by life history type and (PIT tag) origin
- Relate catches to likely pathway through Locks
- Complete processing diet and prey resource samples; compare overlap among prey consumed and availability